



Reduce the risk of Urinary Tract Disease from Struvite and Calcium Oxalate Stones with Sodium Bisulfate: A Healthy Alternative

Struvite stones (magnesium ammonium phosphate) were the most common urolith in cats during the 1980s and has recently returned to being the most prevalent (Osborne et al. 2009)¹. Lowering urine pH, reducing levels of dietary magnesium and phosphorus, and increasing urine volume can help control the formation of struvite. Sodium bisulfate effectively lowers urine pH, does not add phosphorus to the diet, and helps promote increased water consumption, making it a healthy alternative to reduce the risk of urinary tract disease.

Urine Acidification

Urine acidification can dissolve existing struvite crystals and help control the formation of new crystals. Dr. George Fahey evaluated sodium bisulfate for urine acidification (Spears, Grieshp, Fahey 2003)². Eighteen cats were utilized in a four week time period. Three diets contained sodium bisulfate and three contained phosphoric acid. The acidifiers were added at 0.4, 0.6 and 0.8% concentrations. Cats were acclimated to the test diets for 6 days. On day 7, urine samples were collected at 0, 4, and 8 hours post-feeding via cystocentesis. All of the test diets maintained a urine pH between 6.0 and 6.5, the range that helps control struvite formation.

Increased Water Consumption

The addition of sodium bisulfate to the diet can help increase water consumption, which helps reduce the risk of struvite and calcium oxalate stones by diluting the urine. Sodium has a stimulatory effect on

hormones vasopressin and angiotensin, which drive thirst (Blair-West et al 1994)³. WALTHAM Centre for Pet Nutrition assessed the effect of dietary sodium content on the water intake and urine composition of adult cats fed 23 commercially-available dry diets for 21 days (Hawthorne, Markwell 2004)⁴. Cats that were fed diets higher in sodium had higher water intake, increased urine volume, lower urine specific gravity, and lower relative supersaturation for calcium oxalate.

Mode of Action for Urine Acidification

Sodium bisulfate lowers urine pH by the addition of sulfate to the diet. The following excerpt from The Prediction of Urine pH Using Dietary Cations and Anions in Cats Fed Dry and Wet Foods (Ryan et al. 2006)⁵ explains the mode of action in more detail:

"Sodium bisulfate has been shown to lower urine pH in cats. When compared with phosphoric acid, the sodium bisulfate-containing foods were able to maintain similar urine pH and no differences were observed between the 2 dietary acidifiers." "When dietary sulfur (sulfate) and other anions (chloride and phosphorus) are absorbed, there is a shift in the cation-anion balance to a more negative state (toward metabolic acidosis). This results in an increase in arterial concentration of hydrogen ions. The body tries to maintain a slightly alkaline arterial blood pH (approximately 7.4) by responding to this increase in hydrogen ions through 4 processes. The processes include: 1) extracellular buffering; 2) intracellular and bone buffering; 3) respiratory buffering; and 4) renal excretion of the extra hydrogen ions. The first 3 processes take action to minimize the increase in hydrogen concentration until the kidney restores acid-base balance. The kidney restores the acid-base balance by eliminating the excess hydrogen ions in the urine, thus reducing urine pH."

Calcium Oxalate Stones

Research indicates that high levels of calcium in the diet may increase the risk of calcium oxalate formation by increasing urinary calcium concentrations (Stevenson, Hynda, Markwell 2003)⁶. When phosphoric acid is added to the diet, additional calcium may be required to maintain the calcium/phosphorus ratio to prevent bone loss. Phosphoric acid is used for preservation of ingredients, palatability enhancement, and urine acidification. A combination of these uses in the same diet may require high levels of calcium to balance the phosphorus. Sodium bisulfate-Pet® preserves ingredients, improves palatability, acidifies the urine, and promotes water consumption without adding phosphorus.



- 1) Osborne CA, Lulich JP, Kruger JM, Ulrich LK, Koehler LA. Analysis of 451,891 canine uroliths, feline uroliths, and feline urethral plugs from 1981 to 2007: perspectives from the Minnesota Urolith Center. *Vet Clin North Am Small Anim Pract.* 2009 Jan;39(1):
- 2) Spears JK, Grieshop CM, Fahey GC, Jr.: Evaluation of sodium bisulfate and phosphoric acid as urine acidifiers for cats. *Arch Anim Nutr* 2003;57:389-398.
- 3) Blair-West, J. R., Burns, P., Denton, D. A., Ferraro, T., McBurnie, M. I., Tarjan, E. & Weisinger, R. S. (1994) Thirst induced by increasing brain sodium concentration is mediated by brain angiotensin. *Brain Res.* 637: 335-338.
- 4) Hawthorne AJ, Markwell PJ. Dietary sodium promotes increased water intake and urine volume in cats. *J Nutr.* 2004 Aug;134 (8 Suppl): 2128S-2129S.
- 5) Ryan M., Yamka R, Friesen K, Schakenraad H, The Prediction of Urine pH Using Dietary Cations and Anions in Cats Fed Dry and Wet Foods. *Intern J Appl Res Vet Med* · Vol. 4, No. 1. 2006
- 6) Stevenson AE, Hynds WK, Markwell PJ. The relative effects of supplemental dietary calcium and oxalate on urine composition and calcium oxalate relative supersaturation in healthy adult dogs. *Res Vet Sci.* 2003 Aug;75(1):33-41.



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